

COVER PLATE WITH FLOW INDUCER AND METHOD FOR COOLING TURBINE BLADES

FIELD OF THE INVENTION

[0001] This invention relates generally to a flow inducer assembly and a method for cooling turbine blades of a gas turbine engine, in particular, the last stage turbine blades of the gas turbine engine, using ambient air.

DESCRIPTION OF RELATED ART

[0002] An industrial gas turbine engine typically includes a compressor for compressing air, a combustor for mixing the compressed air with fuel and igniting the mixture, a turbine section for producing mechanical power, and a generator for converting the mechanical power to an electrical power. The turbine section includes a plurality of turbine blades that are attached on a rotor disk. The turbine blades are arranged in rows axially spaced apart along the rotor disk and circumferentially attached to a periphery of the rotor disk. The turbine blades are driven by the ignited hot gas from the combustor and are cooled using a coolant, such as a cooling fluid, through cooling passages in the turbine blades.

[0003] Typically, cooling fluid may be supplied by bleeding compressor air. However, bleeding air from the compressor may reduce turbine engine efficiency. Due to high operation pressures of the first, second and third stage turbine blades, bleeding compressor air may be required for cooling the first, second and third stage turbine blades. The last stage turbine blades operate under the lowest pressure, ambient air may be used for cooling the last stage turbine blades. In order to sufficiently cool the last stage turbine blades to achieve required boundary conditions, an efficient flow inducer system is needed to bring sufficient amount of the ambient air into cooling passages of the last stage turbine blade. There is a need to provide an easy and simple system to capture sufficient amount of ambient air into the cooling passages of the last stage turbine blade for sufficiently cooling the last stage turbine blades.

SUMMARY OF THE INVENTION

[0004] Briefly described, aspects of the present invention relate to a gas turbine engine, a seal plate configured to be attached to a rotor disk of a gas turbine engine, and a method for cooling turbine blades of a gas turbine engine.

[0005] According to an aspect, a gas turbine engine is presented. The gas turbine engine comprises a rotor disk comprising a plurality of circumferentially distributed disk grooves. Each disk groove comprises a blade mounting section and a disk cavity. The gas turbine engine comprises a plurality of turbine blades. Each turbine blade comprises a blade root that is inserted into the blade mounting section of the disk groove. The gas turbine engine comprises a plurality of seal plates attached to aft side circumference of the rotor disk. Each seal plate comprises an upper seal plate wall and a lower seal plate wall. The upper seal plate wall is configured to cover the blade root. The gas turbine engine comprises a plurality of flow inducer assemblies. Each flow inducer assembly is integrated to each seal plate at a side facing away from the rotor disk. The flow inducer assembly is configured to function as a paddle due to rotation of the rotor disk and the seal plate therewith during operation of the

gas turbine engine to drive a cooling fluid into the disk cavity and enter inside of the turbine blade from blade root for cooling the turbine blade.

[0006] According to an aspect, a seal plate configured to be attached to a rotor disk of a gas turbine engine is presented. The gas turbine engine comprises a rotor disk comprising a plurality of circumferentially distributed disk grooves. Each disk groove comprises a blade mounting section and a disk cavity. Each turbine blade comprises a blade root that is inserted into the blade mounting section of the disk groove. The seal plate is attached to aft side of the rotor disk. The seal plate comprises an upper seal plate wall configured to cover the blade root. The seal plate comprises a lower seal plate wall. The seal plate comprises a flow inducer assembly integrated to the seal plate at a side facing away from the rotor disk. The flow inducer assembly is configured to function as a paddle due to rotation of the rotor disk and the seal plate therewith during operation of the gas turbine engine to drive a cooling fluid into the disk cavity and enter inside of the turbine blade from blade root for cooling the turbine blade.

[0007] According to an aspect, a method cooling turbine blades of a gas turbine engine is presented. The gas turbine engine comprises a rotor disk comprising a plurality of circumferentially distributed disk grooves. Each disk groove comprises a blade mounting section and a disk cavity. Each turbine blade comprises a blade root that is inserted into the blade mounting section of the disk groove. The method comprises attaching a plurality of seal plates to aft side circumference of the rotor disk. Each seal plate comprises an upper seal plate wall and a lower seal plate wall. The upper seal plate wall is configured to cover the blade root. The method comprises attaching a plurality of flow inducer assemblies to the seal plates. Each flow inducer assembly is integrated to each seal plate at a side facing away from the rotor disk. The flow inducer assembly is configured to function as a paddle due to rotation of the rotor disk and the seal plate therewith during operation of the gas turbine engine to drive a cooling fluid into the disk cavity and enter inside of the turbine blade from blade root for cooling the turbine blade.

[0008] Various aspects and embodiments of the application as described above and hereinafter may not only be used in the combinations explicitly described, but also in other combinations. Modifications will occur to the skilled person upon reading and understanding of the description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Exemplary embodiments of the application are explained in further detail with respect to the accompanying drawings. In the drawings.

[0010] FIG. 1 illustrates a schematic perspective view of a portion of a gas turbine engine showing the last stage, in which embodiments of the present invention may be incorporated;

[0011] FIGS. 2 to 7 illustrate schematic perspective views of flow inducer assemblies according to various embodiments of the present invention;

[0012] FIG. 8 illustrates a schematic perspective view of a portion of a gas turbine engine showing the last stage, in which an embodiment of the present invention shown in FIG. 7 is incorporated; and

[0013] FIG. 9 illustrates a schematic perspective view of a locking plate which is shown in FIG. 8.